MULTIMEDIA UNIVERSITY

STUDENT ID NO

TABLE NO: _____

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2017/2018

TCP2201 OBJECT ORIENTED ANALYSIS AND DESIGN

(All sections/groups)

9 MARCH 2018
9.00 a.m. – 11.00 a.m.
(2 Hours)

Section	Mark
A	
B1	
B2	
B3	
Total	

INSTRUCTIONS TO STUDENTS

1. This question paper consists of twelve (12) printed pages only including the cover page. Two additional blank pages are available at the end for your use.
2. There are two (2) sections in this paper.
3. Answer **ALL QUESTIONS** in both sections.
4. All questions carry equal marks (25 marks) and the distribution of the marks for each sub-question is given.
3. Please write all your answers in the spaces provided in this question paper.

Section A

Instructions: Answer ALL questions in this section by choosing the best answer and writing it in the spaces provided on the right. ***DO NOT CIRCLE/MARK YOUR ANSWER.*** *If you do not follow this instruction, no marks will be given even if your answers are correct. Each question carries two (2) marks for a maximum total of 25 marks.*

[ANSWER]

1. Which control statement below only tests for equality?
   a) if-else
   b) switch-case
   c) for loop
   d) while loop

   [ ]

---

2. A variable declared as protected in a superclass gets inherited by its subclass as a _____ variable.
   a) protected
   b) private
   c) public
   d) package

   [ ]

---

3. To prevent a subclass from inheriting from a superclass, the superclass should be declared as
   a) hidden
   b) protected
   c) private
   d) final

   [ ]

---

4. Which of the following would indicate a *has-a* type of relationship between two objects?
   a) inheritance
   b) composition
   c) association
   d) none of the above

   [ ]

---

5. Following the class naming convention, which of the following name declarations can identify a *variable*?
   a) findA
   b) TotalLength
   c) Class
   d) MYVARIABLE

   [ ]

---

6. Behaviours of objects in the real world are equivalent to class _____
   a) attributes
   b) modules
   c) declarations
   d) methods

   [ ]

Continued...

7. Which pattern is produced by the following code? (Note that the underscores '_' are for clarity to indicate a space and NOT that it prints out an underscore character)

```
for (int i = 1; i <= 6; i++) {
    for (int j = 6; j >= 1; j--)
      System.out.print(j <= i ? j + "_" : "_" + "_");
    System.out.println();
  }
```

a)
```
1
1 2
1 2 3
1 2 3 4
1 2 3 4 5
1 2 3 4 5 6
```

b)
```
        1
      2 1
    3 2 1
  4 3 2 1
5 4 3 2 1
6 5 4 3 2 1
```

c)
```
          1
        1 2
      1 2 3
    1 2 3 4
  1 2 3 4 5
1 2 3 4 5 6
```

d)
```
1 2 3 4 5 6
  1 2 3 4 5
    1 2 3 4
      1 2 3
        1 2
          1
```

[ ]

---

8. Variables that are shared by every *instance* of a class are called _____

a) Instance variables
b) Shared variables
c) Class variables
d) Public variables

[ ]

---

9. How many times will the following code print "Welcome to OOAD"?

```
int count = 0;
do {
  System.out.println("Welcome to OOAD");
} while (++count < 10);
```

a) 9 times
b) 10 times
c) 11 times
d) 0 times

[ ]

---

10. Which of the following are key features of object oriented programming?

i. data hiding
ii. data encapsulation
iii. data encryption
iv. data insulation

a) i and iii
b) i and ii
c) ii and iv
d) all of the above

[ ]

Continued...

11. What is the output of this program when compiled and executed?

```
class A {
    public int i;
    public int j;
}
class B extends A {
    void display() {
        super.j = super.j + 1;
        System.out.println(super.i+" "+super.j);
    }
}
class Inheritance {
    public static void main(String[] args) {
        B obj = new B();
        obj.i=3;
        obj.j=5;
        obj.display();
    }
}
```

[ ]

a) 3 4 b) 3 5
c) 3 6 d) 5 3

---

12. Two functions with the same name, parameter signature and return type can only exist if they are
    a) overloaded functions within the same class
    b) overridden functions within the same class
    c) overloaded functions between inherited classes
    d) overridden functions between inherited classes

[ ]

---

13. Which of the following statements are true?
    i. A class can have multiple constructors
    ii. Constructors cannot have return types
    iii. Constructors must have the same name as the class
    iv. Constructors are invoked during object instantiation

[ ]

a) i and ii c) ii and iii
b) i, ii and iii d) all of the above

Continued...

Section B

*Instructions: Answer **ALL** questions in this section by writing it in the spaces provided on after each question. Additional pages have been provided at the end of the question paper for your use if necessary.*

Question 1

a) Consider the following definitions.

```
public class Animal {
      public Animal() { }
}
```

```
public class Mammal extends Animal {
      public Mammal() { super(); }
}
```

```
public interface Winged {
      public void fly();
}
```

```
public interface FourLegged {
   public void walk();
}
```

```
public class Horse extends Mammal implements FourLegged {
      public Horse() { super();}
      public void walk() { System.out.println("1, 2, 3, 4.");}
}
```

Can the following statements of Java code will compile without errors? For those that cannot compile, briefly explain why. [9 marks]

i. `Mammal mammal = new Mammal();`

ii. `Animal animal = new Mammal();`

iii. `Mammal mammal = new Animal();`

iv. `Winged winged = new Winged();`

Continued...

v. `FourLegged fourLegged = new Horse();`

vi. `FourLegged fourLegged = new Mammal();`

b) Abstract classes and interfaces are similar in many ways. What things are allowed in an abstract class that are not allowed in an interface? What is the reason to have interfaces in Java, when everything possible in an interface is possible in an abstract class?

[4 marks]

c) Describe two differences between overloading and overriding

[4 marks]

Continued...

d) Find two things that cause the following code to not compile. Identify (using the line numbers) and explain the errors then rewrite the affected line to fix the error.

[8 marks]

```
 1 final abstract class Animal {
 2   public void speak(){
 3      System.out.println("Hi "+getName());
 4   }
 5   abstract public String getName();
 6 }
 7 public class Dog extends Animal {
 8      public String getname(){ return "Spike";}
 9      public static void main(String[] args){
10            Animal d = new Dog();
11            d.speak();
12            d.getName();
13      }
14 }
```

Continued...

Question 2

a) The MMU Rugby League are rebuilding their fantasy rugby software, and you are tasked with its design. Draw the class diagram to represent the following scenario extracted for the software

A rugby game has up to 50 people involved, who each have a name, and a number. These people may be: players, who also record the number of goals scored; umpires (referee), who record the number of whistles blown; and coaches, who record the number of injuries. Some players are also captains, and record the number of players on their team.

[9 marks]

Continued...

b) Draw a use case diagram for a ticket distributor for a train system. The system includes a traveler, who purchases different types of tickets, and a central computer system, which maintains a reference database for the tariff. Use cases should include: BuyOneWayTicket, BuyWeeklyCard, BuyMonthlyCard, and UpdateTariff. Also include the following exceptional cases: Time-Out (i.e., traveler took too long to insert the right amount), TransactionAborted (i.e., traveler selected the cancel button without completing the transaction), DistributorOutOfChange, and DistributorOutOfPaper.

[8 marks]

Continued...

c) What is the difference between cohesion and coupling? Explain what are the targets for cohesion and coupling that lead to good software design.

[4 marks]

d) Identify the coupling type in the following Java code. Propose a solution to remove the coupling and explain what corrections need to be made

[4 marks]

```
public class Line {
  public Point start, end;
  ...
  public Point getStart() { return start; }
  public Point getEnd()  { return end; }
}

public class Arch {
  private Line baseline;
  ...
  void slant(int newY)
  {
    Point theEnd = baseline.end;
    theEnd.setLocation(theEnd.getX(),newY);
  }
}
```

Continued...

Question 3

a) Any design pattern is described using eight (8) elements of which the final one is the reference page in the *Gang of Four* book. Briefly describe any five (5) of the remaining elements.

[10 marks]

b) Briefly explain the three (3) categories of design patterns.

[3 marks]

c) Describe the advantages of the Singleton pattern and explain how it is achieved.

[4 marks]

Continued...

d) The *gang of four* describe the façade design pattern as one that "provides a unified interface to a set of interfaces in a sub-system to make it easier to use". Explain what do they mean with the statement and give an example that shows the façade principle.

[4 marks]

e) The Façade and Adapter design pattern are quite similar to each other. Explain briefly the essential similarities and differences between them and when they should be used

[4 marks]

End of paper

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